

REMARKS

Claims 1-21 are pending. Claims 1-20, in addition to portions of the specification, have been amended to improve readability. Applicants respectfully request reconsideration of the application in response to the non-final Office Action.

Allowable Subject Matter

Applicants gratefully acknowledge the indication that claims 10 and 20 are allowed.

Applicants also gratefully acknowledge the indication that claims 2-5, 7, 12-15 and 17 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Based on the arguments presented herein, Applicants believe claims 2-5, 7, 12-15 and 17 to be allowable in their present form and, therefore, have decided not to rewrite these claims in independent form at this time.

Claim Rejections – 35 U.S.C. §103(a)

Claims 1, 6, 11, 16 and 21

Claims 1, 6, 11, 16 and 21 have been rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over U.S. Patent No. 6,700,999 to Yang ("Yang") in view of U.S. Patent No. 7,146,025 to Cho et al. ("Cho"). Applicants respectfully traverse the rejection.

Applicants submit that the Office did not establish a prima facie case of obviousness with respect to independent claim 1 because the cited combination of references does not teach or suggest all the claim limitations. (See, MPEP

§2143.03). Claim 1 recites a face detection and tracking system for detecting and tracking a plurality of faces in real time from an input image that includes the following features:

a background removing unit which extracts an area having a motion by removing a background image from the input image;

a candidate area extracting unit which extracts a candidate area in which a face is possibly located in the area having a motion by using a skin color probability map (P_{skin}) generated from a face skin color model and a global probability map (P_{global});

a face area determination unit which extracts independent component analysis (ICA) features from the candidate area and determines whether the candidate area is a face area; and

a face area tracking unit which tracks the face area according to a directional kernel indicating a probability that a face is located in a next frame based on the skin color probability map (P_{skin}).

Applicants respectfully disagree with the Office that Yang teaches or suggests "a background removing unit which extracts an area having a motion by removing a background image from the input image," as recited in claim 1. (See, Office action at page 2). For example, the specification of the instant application describes that, in one embodiment, a background removing unit 10 detects a moving object that is not a background, by using the difference between the input image and a background image stored in advance, and outputs an area obtained by removing the background image from the input image. (Specification at page 8, lines 1-5).

Yang describes a technique for tracking multiple faces in a sequence of digital images that includes, in an initialization sub-subtask, constructing a segmentation mask whose entries are initialized to have a background value. (Yang at col. 3, lines 51-56). Then, Yang describes making a record of a face candidate region's

membership by updating, with each iteration of a segmentation sub-subtask, entries in the segmentation mask that correspond to member entries of the currently located face candidate region to have a non-background value. (Yang at col. 3, lines 56-63). Applicants submit that the recitation of the face candidate region's membership by updating entries of a segmentation mask to have non-background values, as taught by Yang, does not teach or suggest extracting an area having a motion by removing a background image from the input image, as recited in claim 1.

Further, Applicants submit that Yang does not teach or suggest a candidate area extracting unit which extracts a candidate area in which a face is possibly located in the area having a motion by using a skin color probability map (P_{skin}) generated from a face skin color model and a global probability map (P_{global}), as recited in claim 1. For example, Yang describes constructing for each frame a score map, which has values representing a measure of similarity between the value of a corresponding pixel and a human flesh tone, and applying a segmentation operation to the score map in order to locate face candidate regions within it. (Yang at col. 2, lines 36-42 and col. 3, lines 5-7). Thus, Applicants submit that locating face candidate regions in the score map for the frame, as taught by Yang, does not describe locating a candidate area in which a face is possibly located in an area having a motion by using a skin color probability map (P_{skin}) and a global probability map (P_{global}).

For at least these reasons, Applicants submit that claim 1 is patentable over Yang and that Cho does not disclose, and is not purported to disclose, the teachings missing from Yang. Accordingly, Applicants respectfully request that the rejection

under 35 U.S.C. §103(a) of independent claim 1, and of claim 6, which depends therefrom, be withdrawn.

For reasons analogous to those presented for claim 1, Applicants submit that independent claim 11 is also patentable over Yang and that Cho does not disclose, and is not purported to disclose, the teachings missing from Yang. Accordingly, Applicants respectfully request that the rejection under 35 U.S.C. §103(a) of independent claim 11, and of claims 16 and 21, which depend therefrom, be withdrawn.

Claims 8-9 and 18-19

Claims 8-9 and 18-19 have been rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Yang in view of Cho and further in view of U.S. Patent No. 5,034,986 to Karmann et al. ("Karmann"). Applicants respectfully traverse the rejection.

The Office indicates that Yang does not teach "the background removing unit obtains a first area which is not a background by using a brightness difference of the input image and a background image stored in advance, and obtains a second area which is not the background by using a color difference of the input image and the background image stored in advance," as recited in claim 8, and Applicants respectfully disagree that Karmann supplies the teaching missing from Yang. (See, Office action at page 4).

For example, the specification of the instant application describes detecting a moving area of a current image by calculating a difference in pixel brightness of the current image and a background image stored in advance, and comparing the

difference to a fixed threshold to determine whether a pixel is that of the moving area and not the background. (Specification at page 7, lines 7-9). This method can be problematic, however, because the background cannot be removed robustly when the current moving object has the same brightness as that of the background or when the brightness of the background image stored in advance changes by gradual brightness change. (Specification at page 7, lines 10-14). In this case, the probability that an area that is not the background is mistakenly recognized as the background image can be high. (Specification at page 7, lines 15-17).

Thus, the specification of the instant application describes that, in one embodiment, the background removing unit 10 uses a color difference as well as the brightness difference between the images, and can remove the background image robustly against environmental changes by automatically updating the background image gradually. (Specification at page 7, lines 18-21). The background removing unit 10 can first detect an area that is not a background by using the brightness difference, while in the input image, the difference of each of R, G, B components of a pixel can be calculated and a color difference can be obtained by summing up the differences. (Specification at page 7, lines 24-31). Then, by finding an area where a color difference appears, an image in which the background image is removed can be obtained. (Specification at page 7, line 31 to page 8, line 1).

Karmann, on the other hand, teaches that assuming objects to be tracked produce brightness changes due to their motion, the moving objects can be separated from stationary objects and other areas of slow brightness changes by subtracting a sequence of background images from an original image sequence, where the background sequence of images is obtained by spatially selective and

time recursive averaging of the input image sequence. (Karmann at col. 3, lines 7-10 and col. 4, lines 26-33). Karmann further teaches producing a binary sequence of object masks by applying a suitable threshold to the corresponding difference image sequence and explains that the object masks differ from "frame difference" masks acquired from difference images of consecutive images of the original sequence. (Karmann at col. 4, lines 34-41).

Thus, Applicants submit that separating moving objects from stationary objects and other areas of slow brightness changes by subtracting a sequence of background images from an original image sequence, as taught by Karmann, does not teach or suggest using a color difference as well as the brightness difference between the input image and a background image stored in advance.

For at least these reasons, Applicants submit that claim 8 is patentable over Yang and Karmann and that Cho do not disclose, and is not purported to disclose, the teachings missing from Yang and Karmann. Accordingly, Applicants respectfully request that the rejection under 35 U.S.C. §103(a) of claim 8, and of claim 9, which depends therefrom, be withdrawn.

For reasons analogous to those presented for claim 8, Applicants submit that claim 18 is also patentable over Yang and Karmann and that Cho does not disclose, and is not purported to disclose, the teachings missing from Yang and Karmann. Accordingly, Applicants respectfully request that the rejection under 35 U.S.C. §103(a) of claim 18, and of claim 19, which depends therefrom, be withdrawn.

Conclusion

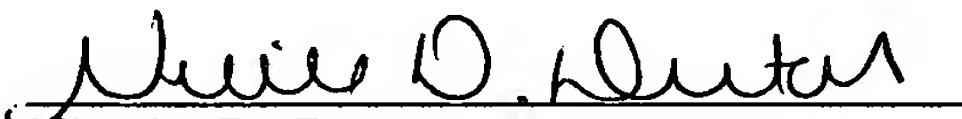
It is believed that this Response and Amendment does not require additional fees. However, if additional fees are required for any reason, please charge Deposit Account No. 02-4800 the necessary amount.

In the event that there are any questions concerning this paper, or the application in general, the Examiner is respectfully urged to telephone Applicants' undersigned representative so that prosecution of the application may be expedited.

Respectfully submitted,

BUCHANAN INGERSOLL & ROONEY PC

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By: 
Nicole D. Dretar
Registration No. 54076

P.O. Box 1404
Alexandria, VA 22313-1404
703 836 6620